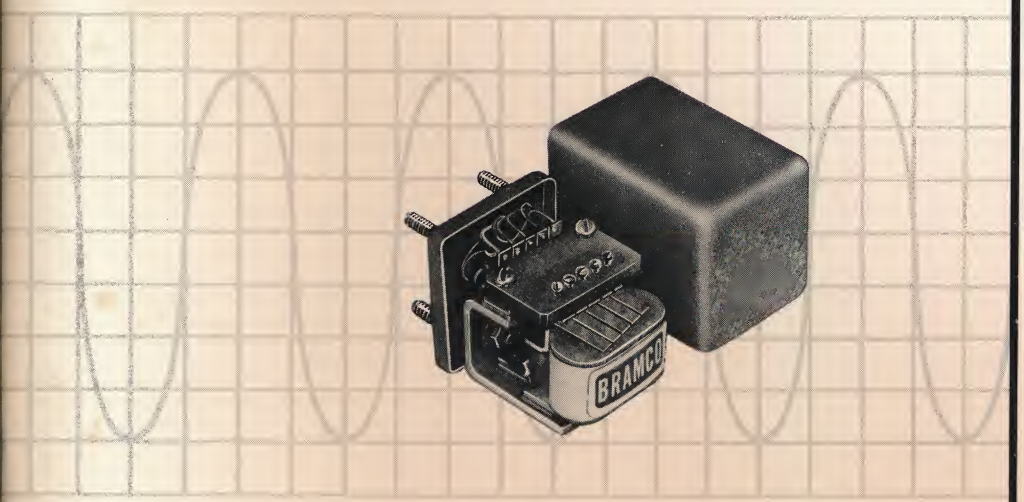


Remote Controls

ENCODER / DECODER COMPONENTS & SYSTEMS TO COMMAND, SELECT, INDICATE, AND REGULATE

LEDEX

BRAMCO CONTROLS DIVISION, LEDEX INC.
College and South Streets, Piqua, Ohio 45356 • Phone 513-773-8271

BRAMCO CONTROLS DIVISION, LEDEX INC.
College and South Streets, Piqua, Ohio 45356 • Phone 513-773-8271

RESONANT REED DEFINITIONS

DATA SHEET 18

Resonant Frequency is the frequency of audio input at which contact closure can be obtained with the least amount of power input.

Natural Frequency is that frequency at which an encoder reed operates.

Design Frequency is the reference frequency from which tuning tolerance and bandwidth are specified.

Frequency Tuning Tolerance is the allowable range within which the resonant (or natural) frequency is tuned.

Frequency Stability is the frequency variation per degree centigrade of temperature change. The change varies inversly to temperature with 25° C. reference.

Bandwidth is the frequency range through which closure occurs at normal operating power level.

Minimum Bandwidth is the frequency range through which contact closure must occur. It is specified at the normal operating power level and referenced to design frequency.

Maximum Bandwidth is the frequency range outside of which contact closure must not occur. It is specified at the normal operate power level and referenced to design frequency.

Threshold Sensitivity is the minimum power level at which contact closure occurs.

Minimum Sensitivity is the power level above which contact closure must occur at design frequency input.

Maximum Sensitivity is the power level below which contact closure must not occur at any frequency input.

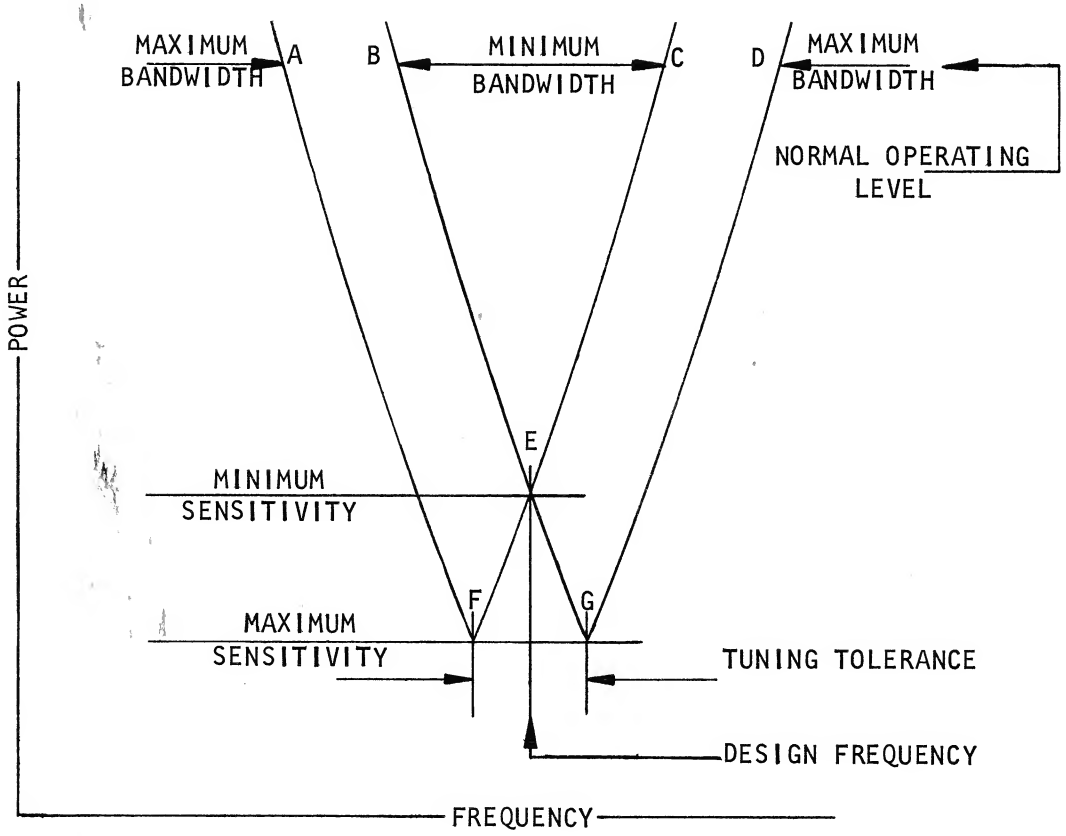
Contact Duty Cycle is the percentage of time the contacts are closed per cycle. It is measured at resonant frequency and normal operating power level.

Contact Rating is the maximum peak voltage and current into a resistive load.

Response Time is the elapsed time between application of the signal to the relay coil and the initial contact closure. It is measured at resonant frequency and normal operating power level.

MORE ▶

Diagram of two relay response curves at extremes of the tuning tolerance, illustrating the derivation of sensitivity and bandwidth specifications.



Area ACF represents response* of a relay tuned to the extreme low limit of tuning tolerance.

Area BDG represents response of a relay tuned to the extreme high limit of tuning tolerance.

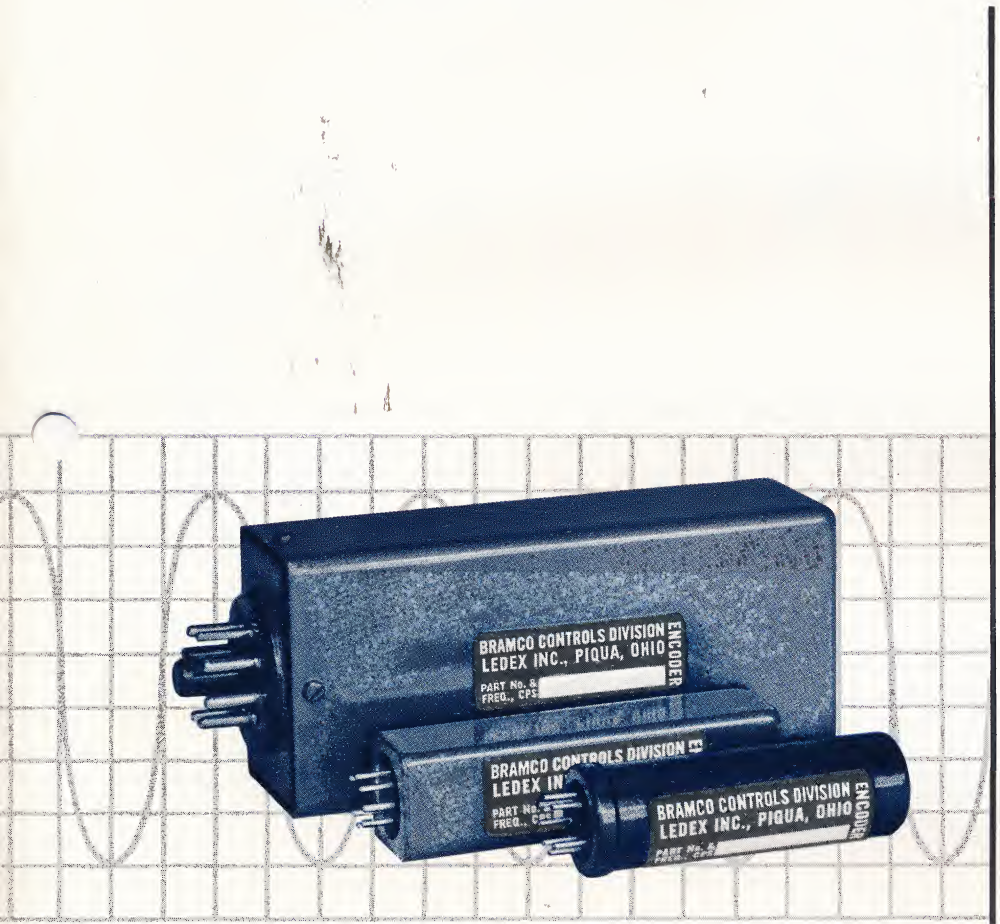
Area BCE represents the <u>assured</u> system <u>response</u>, with any relay tuned within the tuning and bandwidth tolerances.

Area ADFG represents the region within which response may occur, but <u>outside</u> of which response is <u>assured</u> <u>not</u> to occur.

*Response is defined as contact closure obtained by slowly increasing power at fixed frequency settings.

ENCODERS

Bulletin 101



SINGLE CHANNEL

Audio Tone Encoding

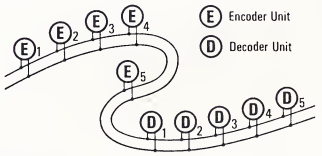
ENCODER COMPONENTS AND SYSTEMS TO COMMAND, SELECT, INDICATE, AND REGULATE

LEDEX®

BRAMCO CONTROLS DIVISION, LEDEX INC., PIQUA, OHIO

audio tone encoding

An audio tone can be generated by an electronic oscillator or resonant reed encoder circuit, then transmitted by wire or radio. The tone activates a resonant reed relay to perform a control function that selects, indicates, or regulates.



A single pair of wires, or a leased telephone line, can carry the audio signals for a complete control system.

For inaccessible areas or mobile installations, a radio transmitter and receiver system can carry the signals.

Bramco* resonant reed encoders are precision electromechanical devices designed for use as the frequency determining components in audio oscillator circuits.

Accurately tuned and processed, the reed is free to vibrate as a single tine of a tuning fork. It is biased by an alnico permanent magnet. As it vibrates, the reed motion induces an impedance change in the coil at the tuned frequency. This impedance change regulates the frequency of the oscillator circuit.

Bramco encoder reeds are engineered for high accuracy. This feature, combined with the narrow response bandwidth of Bramco decoder reeds, permits over 50 selective control frequencies within the 67 to 1600 cps spectrum.

A big advantage of reeds in control switching is that they are ideally suited for simultaneous and sequential coded tone systems. The actual number of control functions possible in such a system is virtually unlimited. For example, over 3300 individual control functions are possible with only 16 frequencies coded sequentially in groups of three.

Bramco resonant reed encoders, compared to other types of audio tone oscillators, offer these main benefits: frequency accuracy, temperature and voltage stability, and simplified frequency changing in the field.

RE1: The RE1, with a broad frequency spectrum of 300 to 1600 cps, is a universal single channel encoder for any remote control system that must deliver reliable performance under tough operating conditions. A floating type internal shock mount assures high stability under mobile conditions—makes it ideal for two way selective call systems in mobile communications and industrial supervisory controls.

RE10: Comparable to the RE1 in construction and performance, the RE10 extends the frequency spectrum to the lower 67 to 300 cps range. If you're concerned about command signals interfering with normal voice communications, a sub-audible selective call system designed around the RE10's low frequency spectrum provides an ideal solution.

ME1C: Plug it in. Add power. This compact encoder module is ready to go to work as delivered. One (or several) ME1C modules comprise the entire encoding portion of your control system.

The transistorized ME1C plug-in encoder is a complete oscillator circuit with a built-in resonant reed stabilizer. Requiring only a DC voltage input, it provides a continuous running fixed audio sine wave output. The output is keyed to give immediate response when a signal is desired.

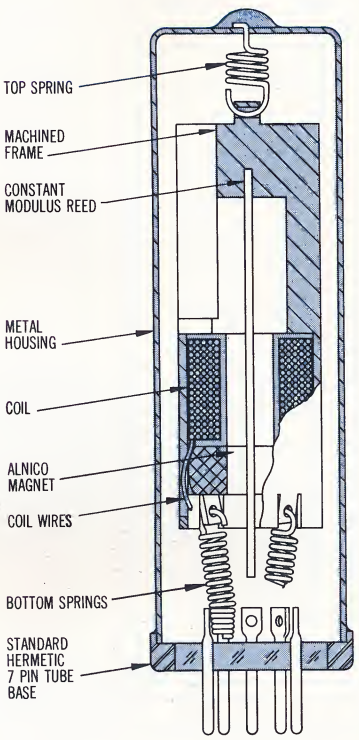
The single channel modular concept offers flexibility, allowing the addition of as many frequencies as required for a particular system. Each module, when individually keyed, provides one control function. For multiple control functions, more than 50 separate frequencies within the 67 to 1600 cps range can be provided for use in one system.

The all-transistorized circuitry is mounted on a rugged glass-epoxy printed circuit board. An internal adjustment control allows the output level to be set from 0 to maximum. The frequency of each module can be conveniently changed by replacing the plug-in resonant reed stabilizer.

A complete high stability oscillator network, the ME1C serves as an economical and dependable encoder for any of Bramco's resonant reed decoder products.

Companion decoder modules and plug-in power supplies are also available.

RE1



*T.M. Reg. U. S. Pat. Off.

RE1
resonant reed oscillator stabilizer

standard specifications

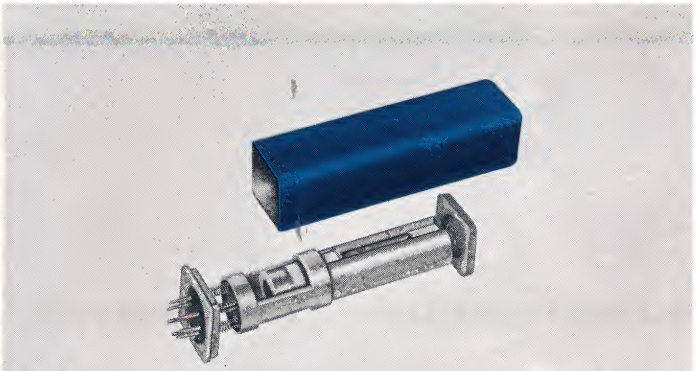
frequency range	300 to 1600 cps
frequency tuning tolerance	±.1%*
frequency stability	varies less than .002% per °C (25°C REF.)
temperature range	−40°C to +85°C
coil resistance	600 ohms dc ±10%
output impedance	depends on circuit used
output	sine wave: amplitude and frequency de
harmonic distortion	depends on circuit used
power required	. . . . .

*STANDARD ENCODERS are tuned to provide the s

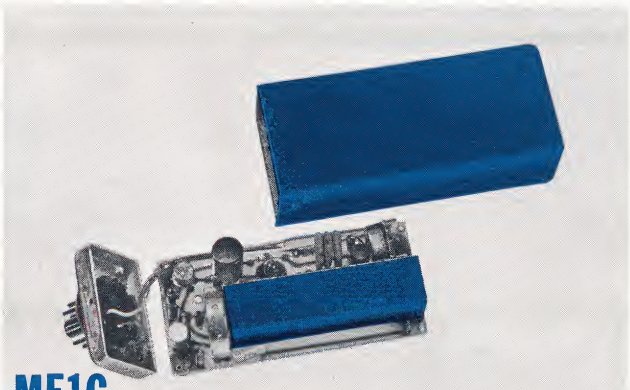
AUDIO TONE CONTROL SYSTEM
USING RE1 OR RE10 ENCODERS

E = encoders, 5 frequencies
T = transmission line: RF carrier or 2 wire loop
D = decoders, 5 frequencies
F = controlled functions

NOTE: Function 4 illustrates the use of two simultaneous or sequential tones to code a single function.



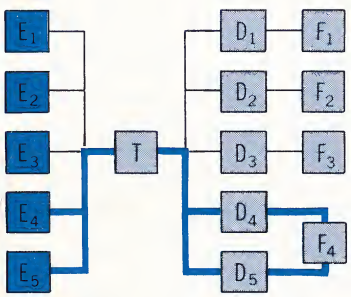
RE10
resonant reed oscillator stabilizer



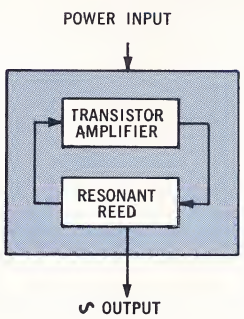
ME1C
resonant reed encoder module

RE10 resonant reed oscillator stabilizer	ME1C resonant reed encoder module
67 to 300 cps	67 to 1600 cps
±.1% or ±.1 cps (whichever is greater)*	±.15%
varies less than .002% per °C (25°C REF.)	varies less than .002% per °C (25°C REF.)
−40°C to +85°C	−40°C to +85°C
600 ohms dc ±10%	. . . . .
depends on circuit used	10K ohms
epending on circuit used	sine wave adjustable to 2 VRMS into 10K load
depends on circuit used	less than 5%
. . . . .	10 ma at 24 vdc

pecified frequency in the encoder circuits shown (Fig. D).



ME1C FUNCTIONAL BLOCK DIAGRAM



dimensional data

base diagrams

FIG. A

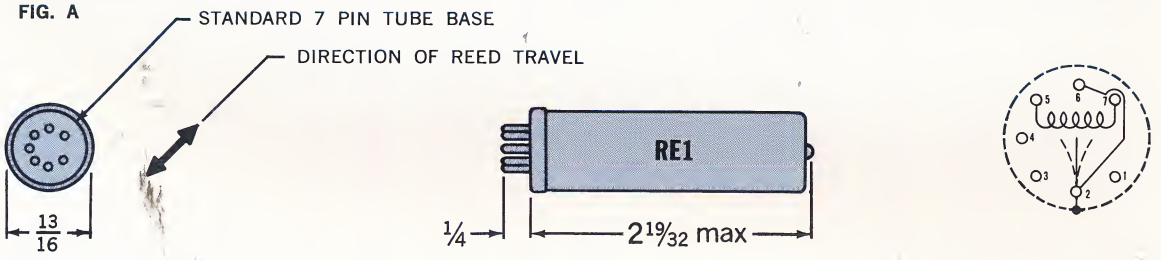


FIG. B

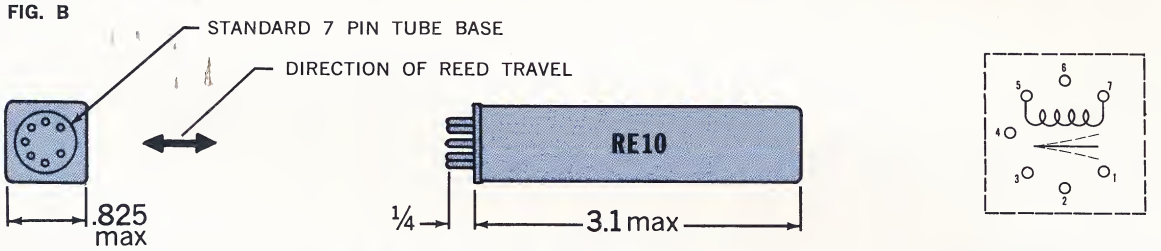
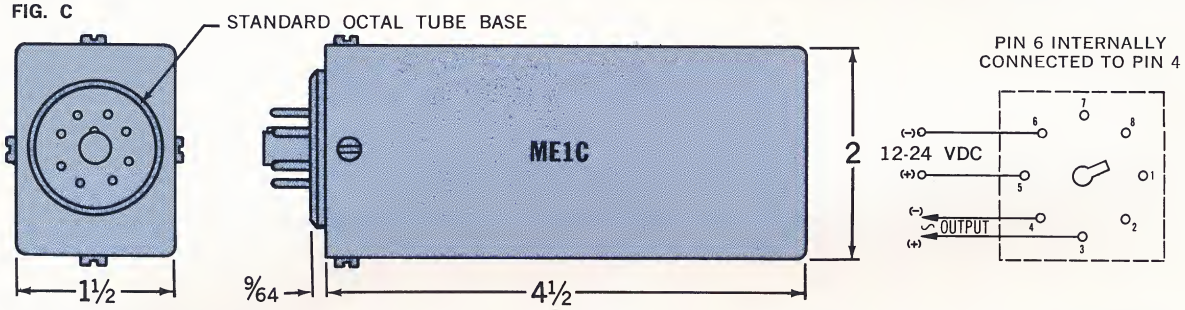


FIG. C



recommended encoder circuitry

Standard RE1 and RE10 encoders are tuned to provide the specified frequency in the encoder circuit (Figure D). The feedback adjustment in the oscillator circuit is provided to set the circuit gain slightly above the oscillator threshold. While not a critical adjustment, excessive feedback will result in output distortion.

Buildup time will vary from .1 to 60 seconds, depending upon frequency and feedback setting. This delay time should be considered when designing your system. The circuit will not free-run when the reed unit is disconnected.

It is recommended that the oscillator run continuously and be keyed to the amplifier to give immediate response when a signal is desired.

FIG. D. RECOMMENDED ENCODER CIRCUIT

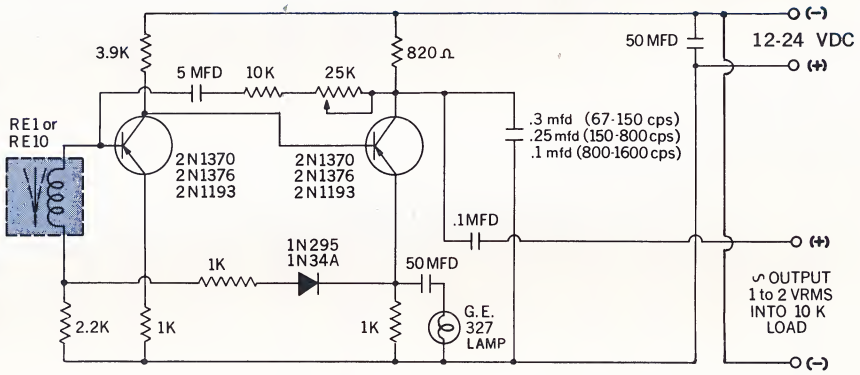
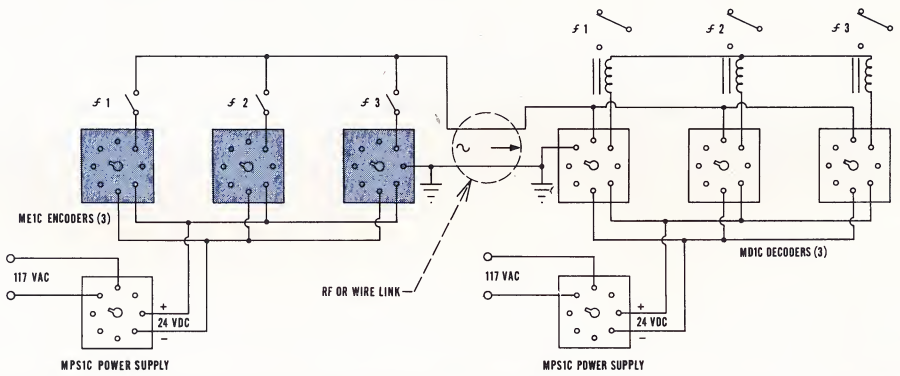


FIG. E. TYPICAL ENCODER-DECODER MODULE WIRING DIAGRAM



specializing in remote controls...

Bramco engineers specialize in remote controls through single and multi-channel frequency sensing encoder/decoder components and modular systems. We welcome the opportunity to share our specialized skills with you. For application assistance, contact the factory or your nearest representative: ▶

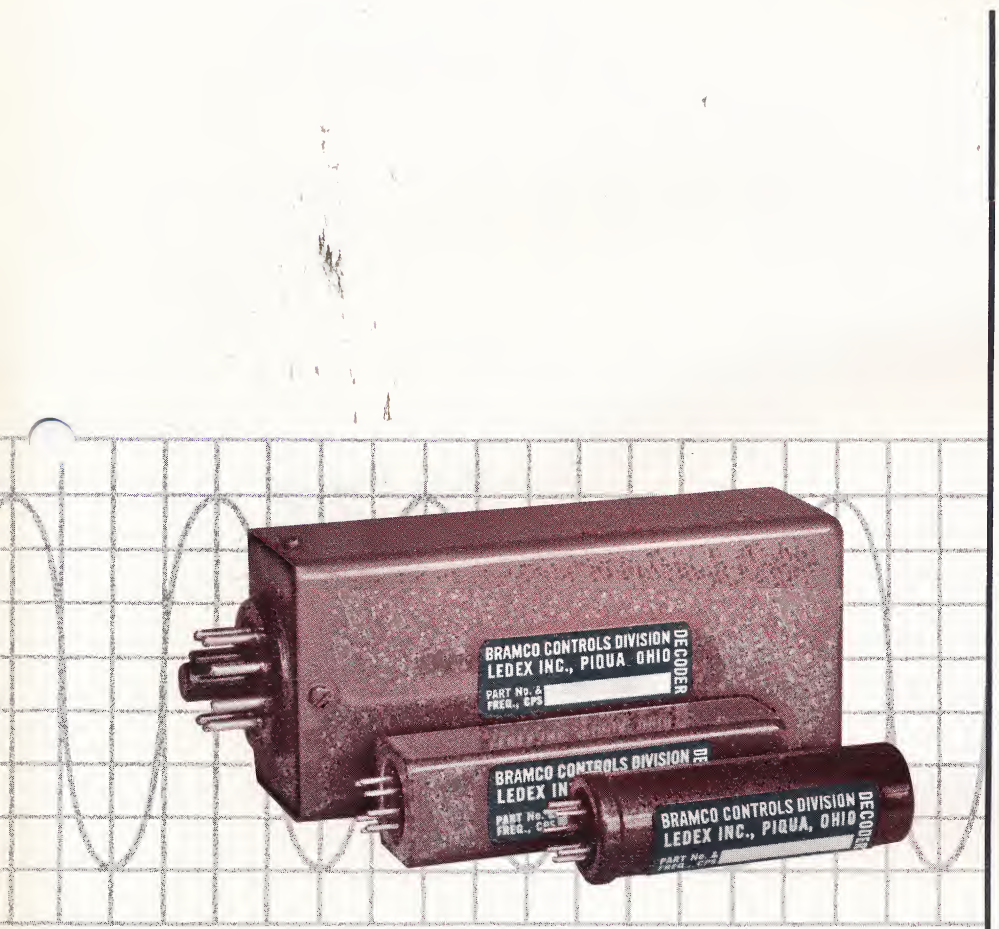
LEDEX

BRAMCO CONTROLS DIVISION, LEDEX INC.

College and South Streets, Piqua, Ohio 45356 • Phone 513-773-8271

DECODERS

Bulletin 202



SINGLE CHANNEL

Audio Tone Decoding

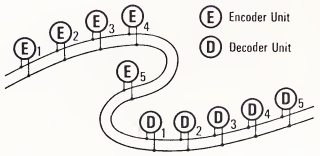
DECODER COMPONENTS AND SYSTEMS TO CONTROL, SELECT, INDICATE, AND REGULATE

LEDEX®

BRAMCO CONTROLS DIVISION, LEDEX INC., PIQUA, OHIO

audio tone decoding

An audio tone can be generated by an electronic oscillator or resonant reed encoder circuit, then transmitted by wire or radio. The tone activates a resonant reed relay to perform a control function that selects, indicates, or regulates.



A single pair of wires, or a leased telephone line, can carry the audio signals for a complete control system.

For inaccessible areas or mobile installations, a radio transmitter and receiver system can carry the signals.

Bramco* resonant reed decoders are precision electromechanical devices that are used as frequency selective filters.

Heart of the decoder is an accurately tuned and processed reed which vibrates as a single tine of a tuning fork. The reed, which is biased by a permanent magnet, has normally open relay contacts. When a predetermined AC signal is introduced, the magnetic field fluctuates, causing the reed to vibrate and the contacts to close intermittently. This provides a switching function. If the load is higher than the reed contact rating, an auxiliary circuit can be used.

Bramco decoder reeds are engineered for narrow response bandwidth. This feature, combined with the high accuracy of Bramco encoder reeds, permits over 50 selective control frequencies within the 67 to 1600 cps spectrum.

A big advantage of reeds in control switching is that they are ideally suited for simultaneous and sequential coded tone systems. The actual number of control functions possible in such a system is virtually unlimited. For example, over 3300 individual control functions are possible with only 16 frequencies coded sequentially in groups of three.

Bramco resonant reed decoders, compared to other types of tone filters, are small and inexpensive. They give more control functions per spectrum, per size, per dollar—often pay for themselves by the wire they save.

*T.M. Reg. U. S. Pat. Off.

RD1: The RD1, with a broad frequency spectrum of 300 to 1600 cps, is a universal single channel decoder for any remote control system that must deliver reliable performance under tough operating conditions. A floating type internal shock mount assures high stability under mobile conditions—makes it ideal for two way selective call systems in mobile communications and industrial supervisory controls.

RD10: Comparable to the RD1 in construction and performance, the RD10 extends the frequency spectrum to the lower 67 to 300 cps range. If you're concerned about command signals interfering with normal voice communications, a sub-audible selective call system designed around the RD10's low frequency spectrum provides an ideal solution.

MD1C: To decode, plug it in. Add power. This compact module is ready to perform your complete decoding function. It contains an all-transistorized 3-stage amplifier, a high stability resonant reed relay, and a secondary transistor switching circuit.

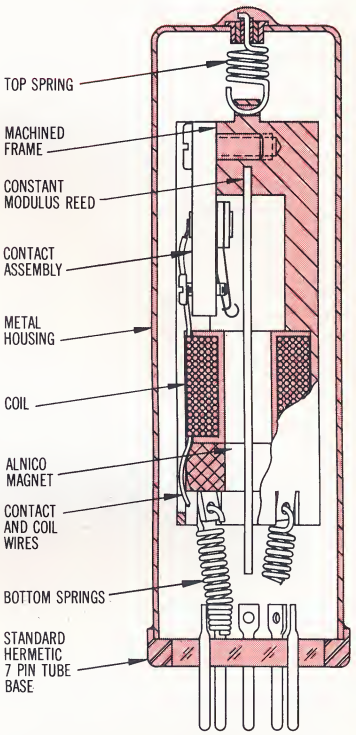
The decoder module is a narrow band audio frequency detector. Its response characteristics are controlled by a frequency sensitive resonant reed relay. When an audio signal of the proper frequency is introduced, the reed resonates at its tuned frequency causing an intermittent contact closure once each cycle. The contact closure triggers the transistor switching circuit which provides a continuous output control function.

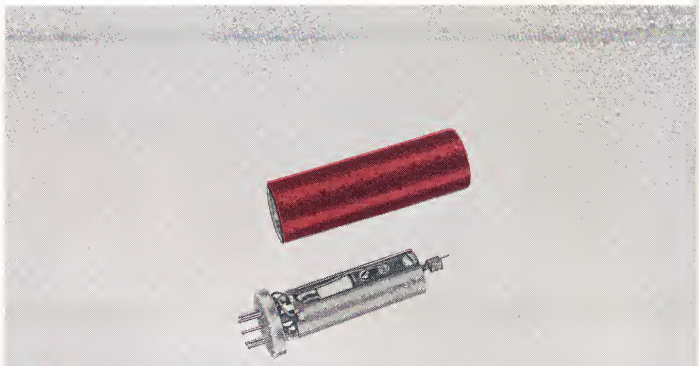
The single channel modular concept offers flexibility, allowing the addition of as many frequencies as required for a particular system.

The complete circuitry is mounted on a rugged glass epoxy printed circuit board. The frequency determining resonant reed relay is a plug-in component —making it easy to change the frequency of the module if desired.

Special relays can be supplied to provide varied response characteristics to customer requirements. Companion encoder modules and plug-in power supplies are also available.

RD1





RD1
frequency sensing resonant reed relay

standard specifications	
frequency range	300 to 1600 cps
frequency stability	varies less than .002% per °C (25°C REF.)
temperature range	−40°C to +85°C
bandwidth	±.25% minimum, ±1.5% maximum*
operating voltage level	6 VRMS
coil resistance	600 ohms dc ±10%
input impedance	. . . . .
sensitivity	.75 VRMS max., 2.0 VRMS min.*
contact duty cycle	10% min. at resonant freq., 6 VRMS
contact rating	100 ma peak at 12 vdc resistive load
power required	. . . . .

*SPECIAL RELAYS can be supplied with varying bandwidths and ser

AUDIO TONE CONTROL SYSTEM USING RD1 OR RD10 DECODERS

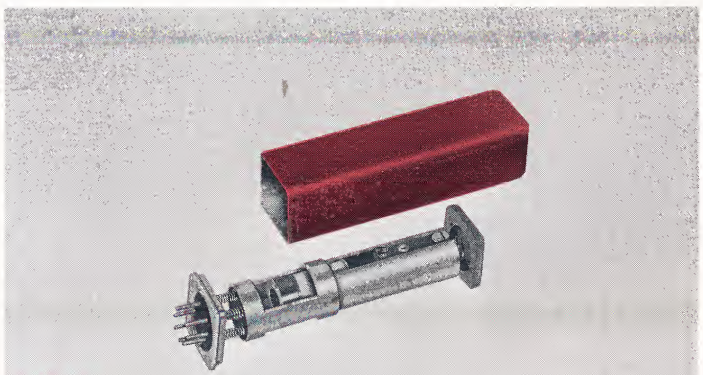
E = encoders, 5 frequencies

T = transmission line: RF carrier or 2 wire loop

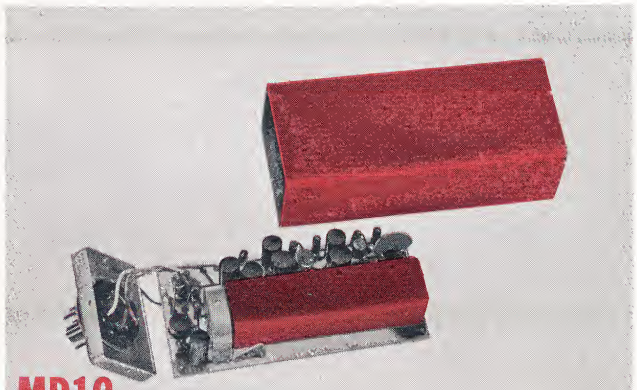
D = decoders, 5 frequencies

F = controlled functions

NOTE: Function 4 illustrates the use of two simultaneous or sequential tones to code a single function.



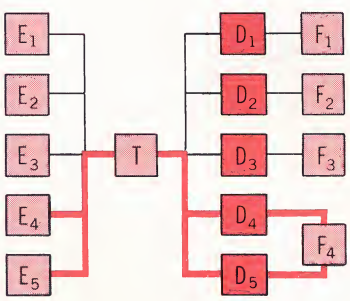
RD10
frequency sensing resonant reed relay



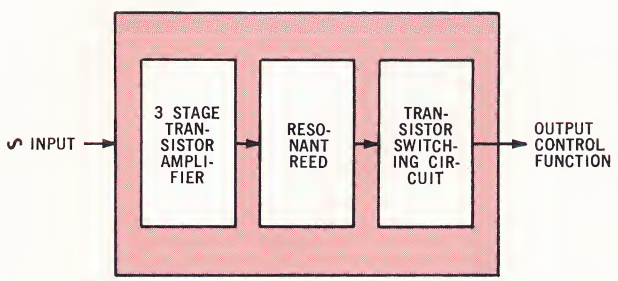
MD1C
resonant reed decoder module

RD10	MD1C
67 to 300 cps	67 to 1600 cps
varies less than .002% per °C (25°C REF.)	varies less than .002% per °C (25°C REF.)
−40°C to +85°C	−40°C to +85°C
±1.0% minimum, ±2.0% maximum*	±.25% minimum, ±2.0% maximum*
3 VRMS	0.1 to 5.0 VRMS
600 ohms dc ±10%	. . . . .
. . . . .	10K ohms
.75 VRMS max., 1.5 VRMS min.*	. . . . .
10% min. at resonant freq., 3 VRMS	external load: 500 ohms minimum
100 ma peak at 12 vdc resistive load	50 ma maximum at 24 vdc
. . . . .	20 ma at 24 vdc + external load

sitivities to meet customer requirements.



MD1C FUNCTIONAL BLOCK DIAGRAM



dimensional data

base diagrams

FIG. A

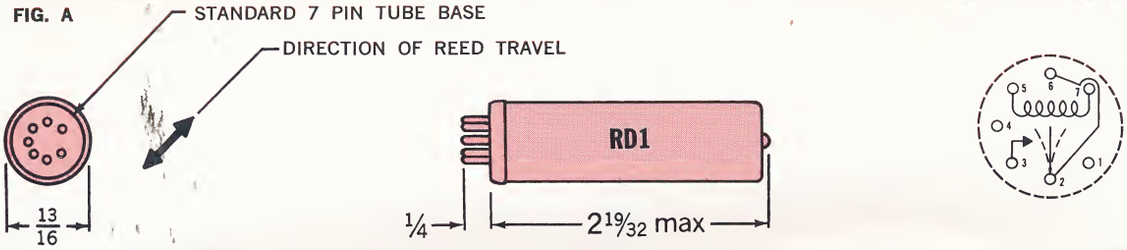


FIG. B

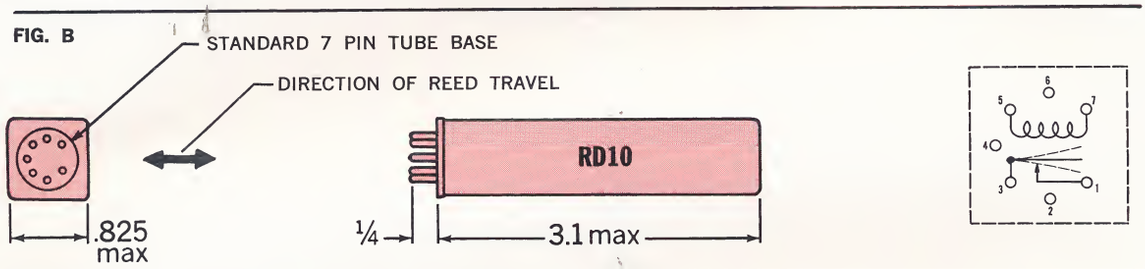
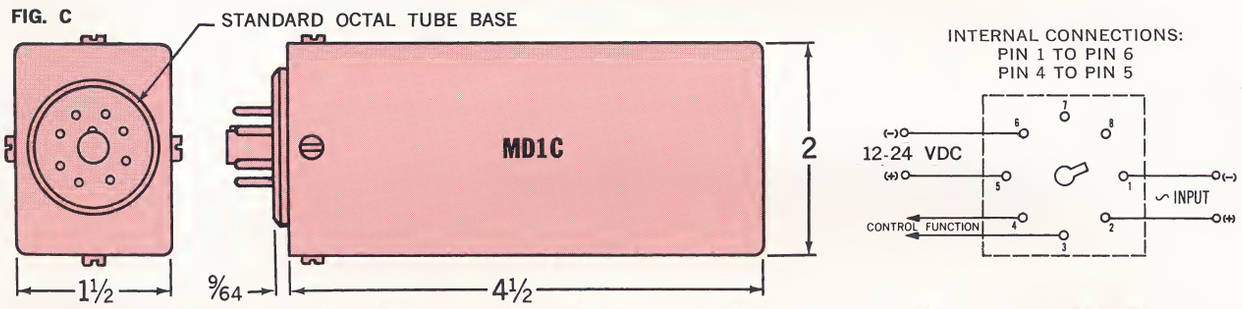


FIG. C



recommended decoder circuitry

The contacts of a resonant reed relay provide an intermittent closure, once each cycle. Continuous closure and heavier switching capacity is obtained by integrating a secondary relay, directly, or through a tube or transistor amplifier. Typical circuits for each method are illustrated in figures D, E, and F.

FIG. D. SECONDARY RELAY

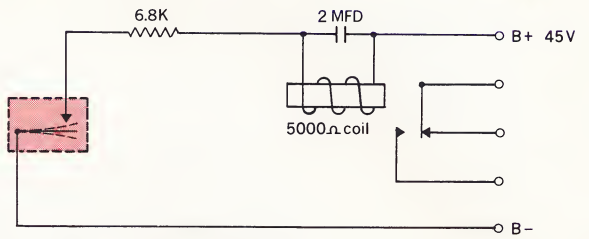


FIG. E. TUBE 6C4

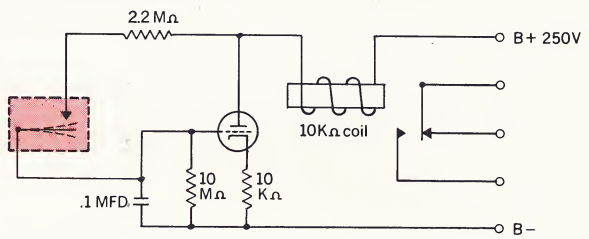


FIG. G. 2-TONE SIMULTANEOUS DECODER CIRCUIT

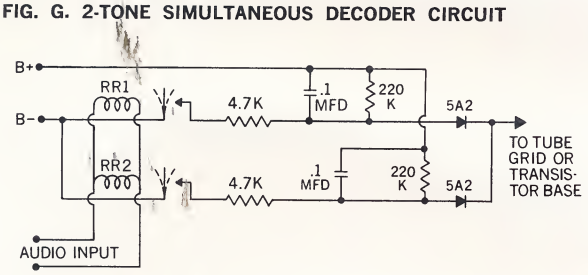


FIG. F. TRANSISTOR AMPLIFIER

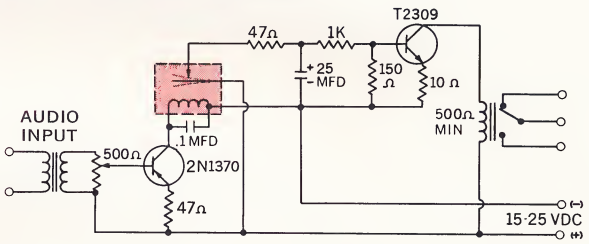
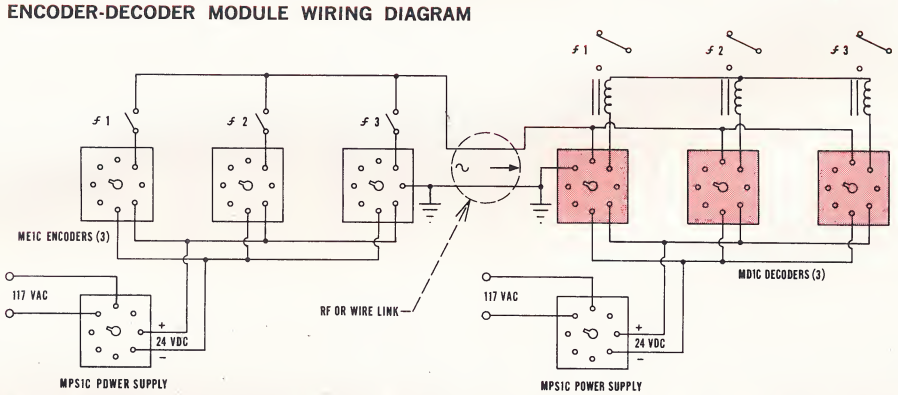


FIG. H. TYPICAL ENCODER-DECODER MODULE WIRING DIAGRAM



specializing in remote controls...

Bramco engineers specialize in remote controls through single and multi-channel frequency sensing encoder/decoder components and modular systems. We welcome the opportunity to share our specialized skills with you. For application assistance, contact the factory or your nearest representative: ▶

LEDEX®

BRAMCO CONTROLS DIVISION, LEDEX INC.
College and South Streets, Piqua, Ohio 45356 • Phone 513-773-8271

BRAMCO CONTROLS DIVISION, LEDEX INC.
College and South Streets, Piqua, Ohio 45356 • Phone 513-773-8271

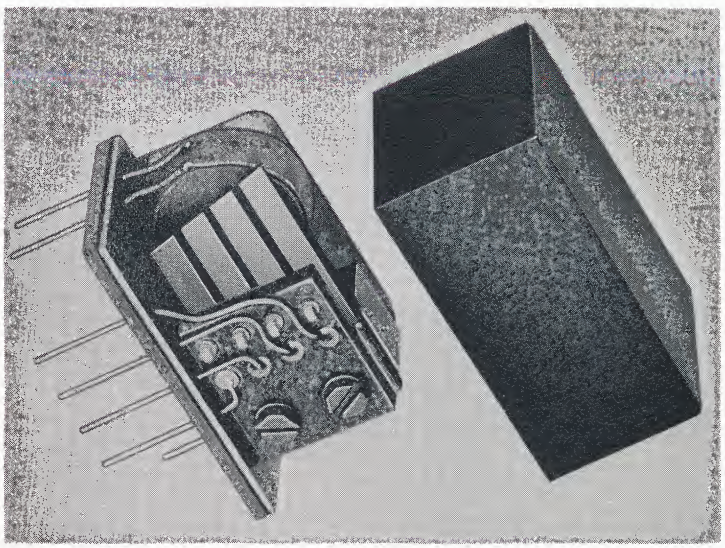
RD7C FOUR CHANNEL RESONANT REED RELAY

DATA SHEET NO. 21

The RD7C miniature resonant reed relay has four channels in a package volume of approximately 1/2 cubic inch - or 1/8 cubic inch per channel.

Signals to the small multi-channel resonant reed relay can be transmitted over a single wire loop or RF channel. Upon receiving the predetermined AC signal, the selected reed (or reeds) resonates. Any of the four channels can be closed independently. Contacts on the reeds then perform the switching functions. The reeds can be tuned to provide over 50 separate control frequencies within a spectrum of 150 to 700 cps.

The RD7C, besides being miniaturized, is designed to operate in narrow bandwidths (±1.5% maximum). It is highly sensitive, requiring only 15 milliwatts normal drive level.



STANDARD SPECIFICATIONS

Number of Channels: 1, 2, 3 or 4

Frequency Range: 150 to 700 CPS
Standard: 313.0, 349.0, 389.0, 433.7

Frequency Stability: varies less than .0025% per °C (25°C ref.)

Temp. Range: -40°C to +85°C

Response Bandwidth: ±.5% minimum and ±1.5% maximum

Operating Voltage Level: 4 VRMS

Sensitivity: .5 VRMS maximum
1.5 VRMS minimum

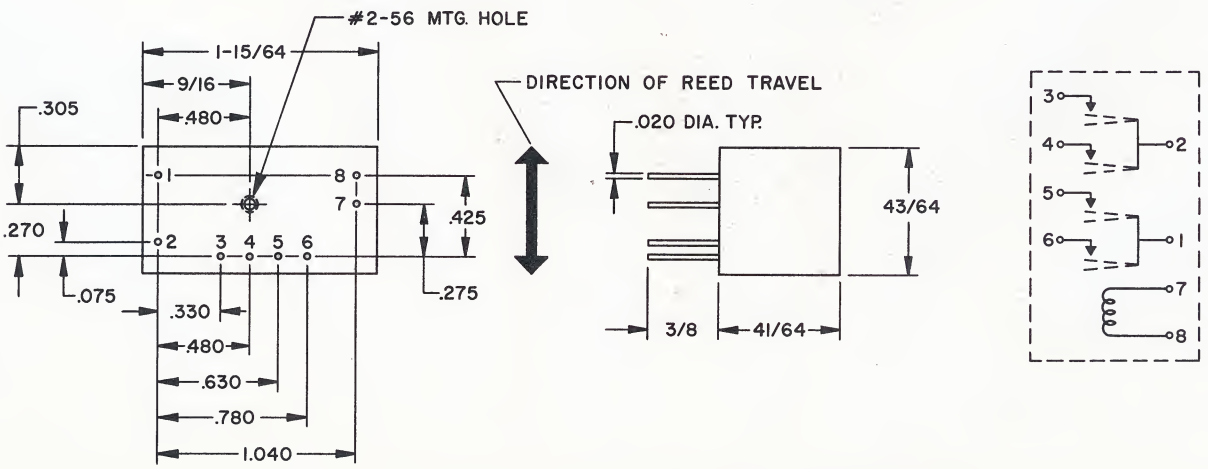
Coil Resistance: 1150 ohms DC ±10%

Contact Duty Cycle: 10% minimum at resonant frequency and 4 VRMS

Contact Rating: 10 ma peak at 12 VDC resistive load

Mounting: Printed circuit board

Weight: 3/4 ounce



BRAMCO CONTROLS DIVISION, LEDEX INC.
College and South Streets, Piqua, Ohio 45356 • Phone 513-773-8271

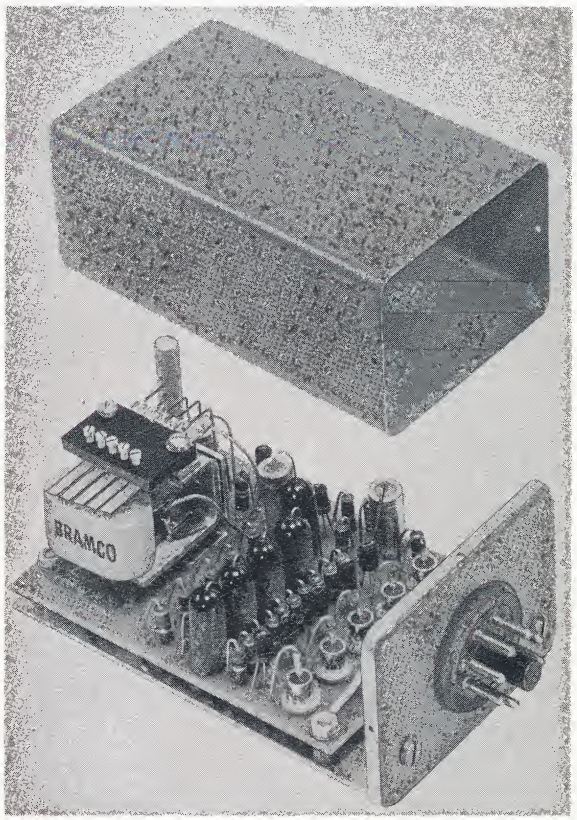
MD5C FIVE CHANNEL DECODER MODULE

DATA SHEET NO. 20

Plug it in. Add power. This five channel resonant reed decoder is ready to perform five separate remote switching functions - in the least amount of space and the lowest possible cost per channel. It includes a transistorized two-stage amplifier, a five channel resonant reed relay and five secondary transistorized switching circuits.

The module is a multi-channel narrow band audio frequency detector with response characteristics controlled by five frequency sensitive resonant reeds. When an audio signal of proper frequency is introduced, one of the five selected reeds resonates at its tuned frequency, causing an intermittent contact closure once each cycle. The contact closure triggers the corresponding transistor switching circuit, which then provides a continuous output control function.

The individual outputs can control secondary relays which are wired into logic circuits to provide a control function only when a sequential or simultaneous tone code is received.

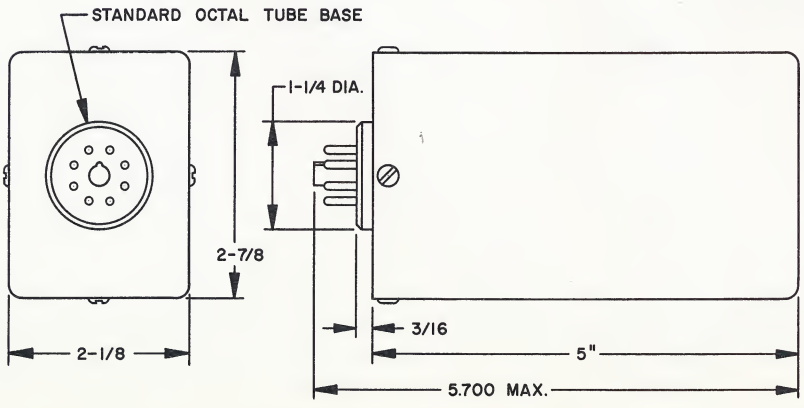


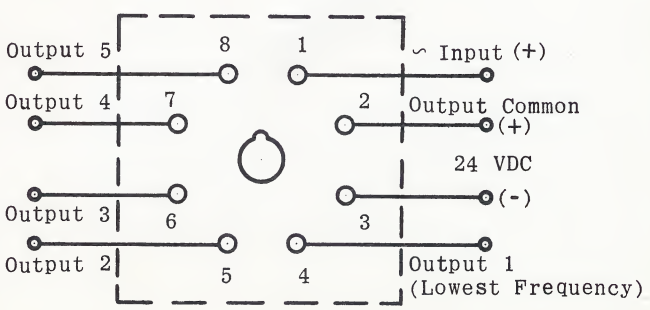
STANDARD SPECIFICATIONS

Number of Channels: 2,3,4 or 5
Frequency Range: 200 to 600 CPS
Frequency Stability: varies less than .002% per °C (25°C ref.)
Response Bandwidth: ±.25% minimum at 1.5 VRMS
±2.5% maximum at 5.0 VRMS
Operating Voltage: 1.5 to 2 VRMS for linear bandwidth response
2 to 5 VRMS for constant bandwidth response

Input Impedance: 0.2 megohms minimum
Sensitivity: 0.1 VRMS maximum
External Load: 500 ohms minimum, each output
Output Rating*: 24 VDC at 50 ma maximum, each output, switching through external loads to B+
Power Required: 30 ma at 24 VDC, plus external loads

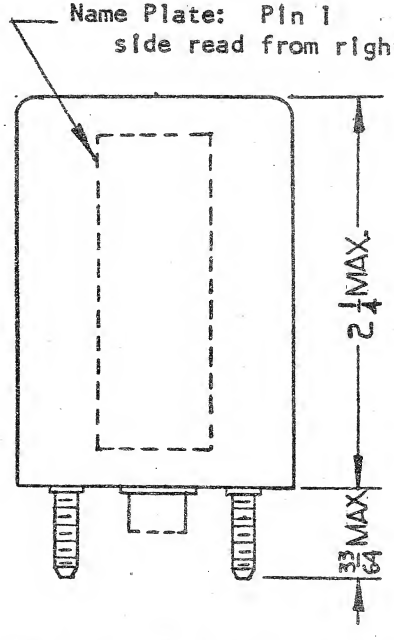
*Continuous output when signal within response bandwidth is applied to input.

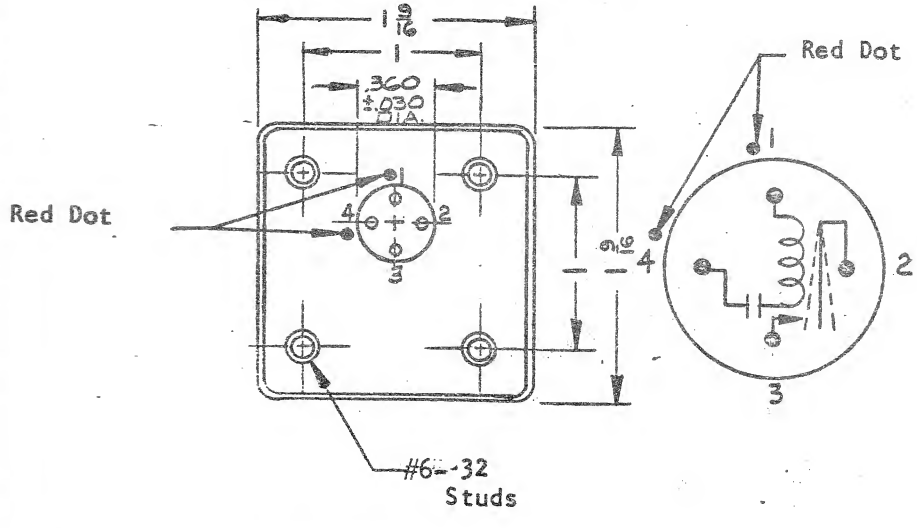




10/64

NO. 516 A01202-00001 REV. 0





SPECIFICATIONS:

1. Design Frequency: 400 cps.
2. Temperature Stability: Frequency of bandwidth limits will not change more than ±.002% per degree C. (25°C REF.)
3. Coil Resistance: 600 ohm D. C. ±10% (25°C)
4. Bandwidth: ±4% min. and ±5% max. at 115.0 VRMS drive level.
5. Contact Rating: 100 MA. peak at 50 VDC. (resistive load).
6. Temperature Range: -40°C to +70%C.

REV. NO.	REVISIONS	BY	DATE	D. R. REV.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES BEFORE / AFTER HEAT TREAT & FINISH. LIMITS: FRACTIONS ± .010 DECIMALS ± .005 ANGLES ± 1° LEADS ± 5° TO CENTER LINE SHOWN.

MATERIAL

HEAT TREAT

FINISH: Gray Paint

NEXT ASSY. (FIRST USED) | FINAL ASSY. (FIRST USED)

MODEL: Special

BRAMCO INC.
SUBSIDIARY OF
LEDEX INC.
COLLEGE AND SO. STS.
PIQUA, OHIO

INDEX | SCALE 1/1

DES. E. Stoddard DATE 12-14-62

CKR. | DATE /

ENGR. Mc Swan | RELEASE DATE 10-19-62

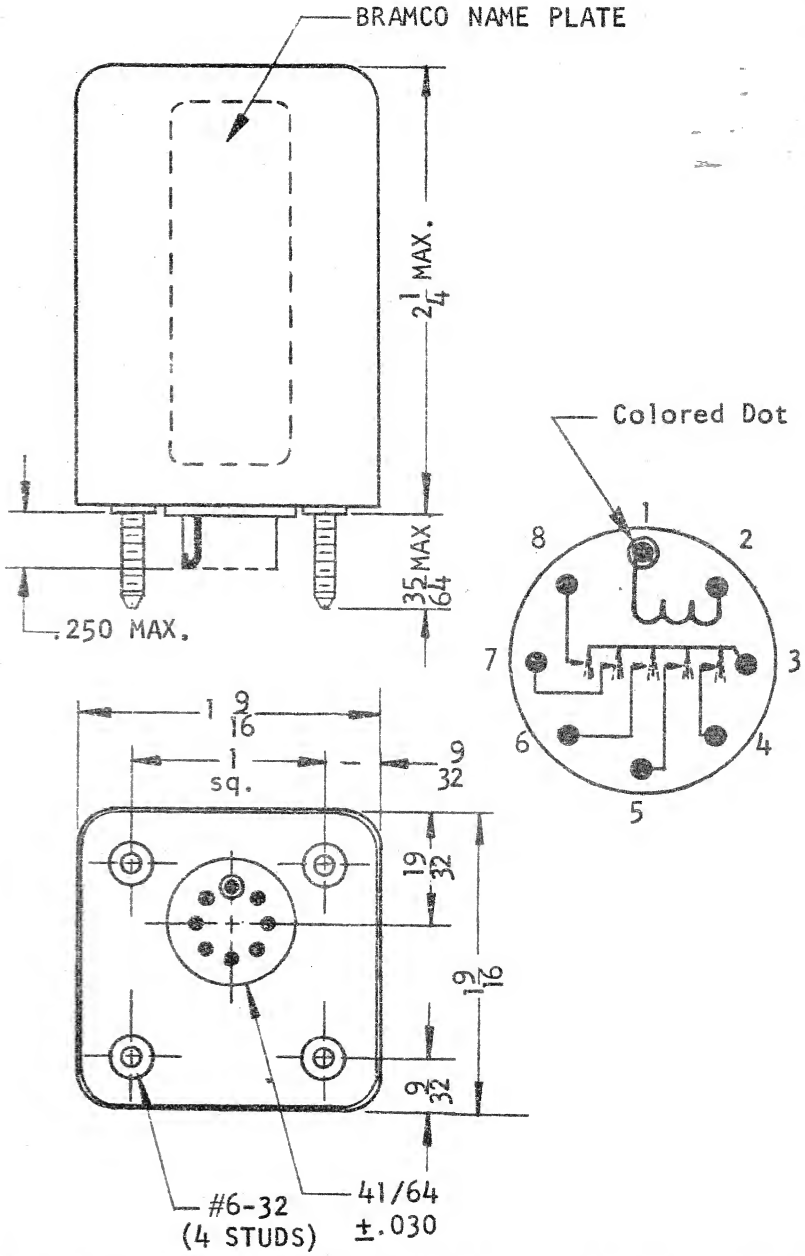
SUPERSEDES:

TITLE: RESONANT REED RELAY

NO. A01202-00001 REV. 0

SHEET | OF

NO.	REV.
A01287-00001	1



SPECIFICATIONS: (at 25 degrees C)

1. Coil Resistance: 530 ohms ±10%.
2. Frequency Stability: Frequency change less than .002% per Degree C over the range of -40 degrees to +85 Degrees Centigrade.
3. Maximum Sensitivity: There will be no contact closure below 1.0 VRMS at any frequency.
4. Minimum Sensitivity: There will be contact closure at 2.0 VRMS at design frequency.
5. Bandwidth: ±0.5% Min. and ±2.0% Max. at 6.0 VRMS.
6. Contact Current: 100 ma. peak at 50 VDC (Resistive load; pins 4 through 8 positive (+) with respect to pin 3).
7. Design Frequency: (CPS)

PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
COMMON	313.0	349.0	389.0	433.7	483.5

NOTE: Design Range 200 - 600 cps.

REV. NO.	REVISIONS	BY	DATE
1	Add Note 860	F.S.	3/4

MATERIAL

FINISH: RED PAINT

DFT. [illegible] DATE 2-21-64

CKR. DATE

ENGR. W. Swen RELEASE DATE 2-21-64

FINAL ASS'Y. (FIRST USED)

SUPERSEDES: A01251-00001

MODEL: RD5S

NEXT ASS'Y (FIRST USED)

BRAMCO CONTROLS DIV.
LEDEX INC.
PIQUA, OHIO

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED
LIMITS: FRACTIONS ±1/64
DECIMALS ±.008 ANGLES ±1°

Title: HERMETICALLY SEALED 5 CHANNEL RESONANT REED RELAY

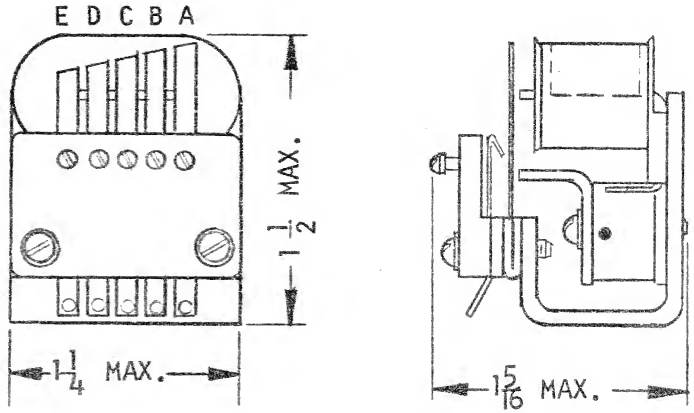
SHEET 1 OF 1

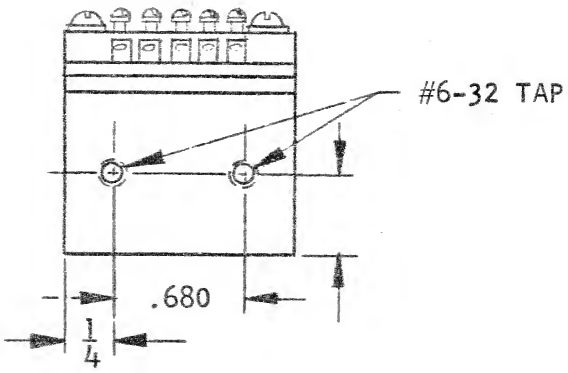
NO. A01287-00001

REV. 1

FORM # 002 REV. 1/10/64

NO.	REV.
A01284-00001	1



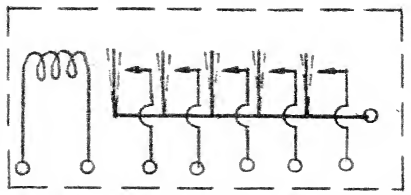


SPECIFICATIONS: (at 25°C)

1. Coil Resistance: 530 ohms ±10%.
2. Frequency Stability: Frequency change less than .002%/°C over the range of -40° to +85°C.
3. Maximum Sensitivity: There will be no contact closure below 1.0 VRMS at any frequency.
4. Minimum Sensitivity: There will be contact closure at 2.0 VRMS at design frequency.
5. Bandwidth: ±0.5% Min. and ±2.0% Max. at 6.0 VRMS.
6. Contact Current: 100 ma. peak at 50 VDC (Resistive Load; contacts + with respect to reeds).
7. Design Frequency: (CPS)

REED A	REED B	REED C	REED D	REED E
313.0	349.0	389.0	433.7	483.5

NOTE: Design range 200 - 600 cps.



SCHEMATIC

REV. NO.	REVISIONS	BY	DATE
1	863 Redraw, no change	FS	3/6/64

MATERIAL		DR. [signature]	DATE 3-6-64
		CKR.	DATE
FINISH		ENGR. [signature]	RELEASE DATE 3-6-64
		FINAL ASS'Y. (FIRST USED)	
SUPERSEDES: A01252-	MODEL: RD-5	NEXT ASS'Y (FIRST USED)	

BRAMCO CONTROLS DIV. LEDEX INC. PIQUA, OHIO	DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED LIMITS: FRACTIONS ±1/64 DECIMALS ±.008 ANGLES ±1°	Title: RESONANT REED RELAY	SHEET 1 OF 1	NO. A01284-00001 REV. 1

BRAMCO CONTROLS DIVISION, LEDEX INC.
College and South Streets, Piqua, Ohio 45356 • Phone 513-773-8271

STANDARD FREQUENCY CHART DATA SHEET 19

The frequencies listed below have been established to allow adequate separation and minimum harmonic relationship for use in multiple frequency systems.

FREQ. C.P.S.	EIA CODE	FREQ. C.P.S.	EIA CODE	FREQ. C.P.S.	EIA CODE	FREQ. C.P.S.	EIA CODE
67.0	L 1	192.8	7A	410.8	114	810.2	157
71.9	L 2	203.5	M1	422.1	145	832.5	127
77.0	L 3	210.7	M2	433.7	115	855.2	158
82.5	L 4	218.1	M3	445.7	146	879.0	128
88.5	L 4A	225.7	M4	457.9	116	903.0	159
94.8	L 5	233.6	M5	470.5	147	928.1	129
100.0	1	241.8	M6	483.5	117	953.7	160
103.5	1A	250.3	M7	496.8	148	979.9	130
107.2	1B	258.8	136	510.5	118	1006.9	161
110.9	2	266.0	106	524.6	149	1049.6	131
114.8	2A	273.3	137	539.0	119	1084.0	P
118.8	2B	280.8	107	553.9	150	1120.0	S11
123.0	3	288.5	138	569.1	120	1190.0	S12
127.3	3A	296.5	108	582.1	H	1220.0	S2
131.8	3B	304.7	139	600.9	121	1265.0	S14
136.5	4	313.0	109	617.4	152	1291.4	S3
141.3	4A	321.7	140	634.5	122	1320.0	S15
146.2	4B	330.5	110	651.9	153	1355.0	S16
151.4	5	339.6	141	669.9	123	1400.0	S17
156.7	5A	349.0	111	688.3	154	1430.5	S7
162.2	5B	358.6	142	707.3	124	1450.0	S18
167.9	6	368.5	112	726.8	155	1500.0	S20
173.8	6A	378.6	143	746.8	125	1520.0	S9
179.9	6B	389.0	113	767.4	156	1550.0	S21
186.2	7	399.8	144	788.5	126	1600.0	S22

MODEL	RECOMMENDED RANGE	TOTAL RANGE
RD 10, RE 10	67-300 (39)	67-1600 (100)
RD 1, RE 1	300-600 (25)	300-1600 (61)
RD 5	200-600 (38)	100-1000 (77)
RD 7	150-500 (40)	150-700 (52)

Figures in parentheses are the number of standard frequencies possible within the listed range.

BRAMCO CONTROLS DIVISION PIQUA, OHIO

PRICES EFFECTIVE 6-1-64

Note: All Prices Based On Standard Coils, Tuning Tolerances, and Recommended Frequency Ranges

	NUMBER OF REEDS				
RD5 DECODER	1	2	3	4	5
1-9	$11.00	$12.00	$13.50	$15.00	$17.00
10-24	8.15	9.00	10.00	11.00	12.50
25-99	7.25	8.05	8.95	9.85	11.25
100-499	5.50	6.00	6.80	7.60	8.50
500-999	4.60	5.00	5.65	6.30	7.15
1000-4999	3.95	4.45	5.00	5.55	6.30
RD5S DECODER					
1-9	21.50	22.75	24.50	26.25	28.50
10-24	15.65	16.75	18.00	19.25	21.00
25-99	13.90	14.90	16.00	17.10	18.75
100-499	10.60	11.20	12.30	13.20	14.20
500-999	9.15	9.60	10.30	11.00	11.90
1000-4999	7.95	8.50	9.10	9.70	10.50
RD7 DECODER					
1-9	22.00	24.00	27.00	30.00	
10-24	16.30	18.00	20.00	22.00	
25-99	14.50	16.10	17.90	19.70	
100-499	11.00	12.00	13.60	15.20	
500-999	9.20	10.00	11.30	12.60	
1000-4999	7.90	8.90	10.00	11.10	

MORE

SINGLE CHANNEL REED COMPONENTS

QUANTITY	RE1 & RE10 ENCODERS	RD1 & RD10 DECODERS
1-9	$17.50	$17.50
10-24	15.00	15.00
25-99	12.50	12.50
100-499	10.50	11.00
500-999	9.00	9.50
1000-4999	8.00	8.50

TONE SIGNALING MODULES

QUANTITY	ME1C ENCODER	MD1C DECODER	MD5C DECODER	MPS1C POWER SUPPLY
1-9	$39.00	$39.00	$55.00	$44.00
10-24	36.00	36.00	49.00	40.00
25-99	33.00	33.00	44.00	36.00
100-499	29.50	29.50	38.00	32.00

BRAMCO CONTROLS DIVISION, LEDEX INC.
College and South Streets, Piqua, Ohio 45356 • Phone 513-773-8271

DATE _____

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____ **REPLY CARD**

CITY & STATE _____

☐ HAVE REPRESENTATIVE CALL: MY PHONE NUMBER IS _____

☐ SEND SPECIFIC INFORMATION ON A DESIGN THAT MEETS THE REQUIREMENTS LISTED BELOW.

APPLICATION: _____

QUOTATION QUANTITIES: _____

Fold _____ Here

NUMBER OF CHANNELS PER RELAY: _____

FREQUENCIES: _____ TOL. ± _____ %

BANDWIDTH:

MINIMUM ± _____ % AT _____ VRMS

MAXIMUM ± _____ % AT _____ VRMS

SENSITIVITY:

MINIMUM _____ VRMS MAXIMUM _____ VRMS

COIL: _____ OHMS DC RESISTANCE

PACKAGE:

☐ OPEN FRAME ☐ COVERED

☐ SEALED ☐ SHOCK MOUNTED

☐ MODULE, INCLUDING ASSOCIATED CIRCUITRY

ADDITIONAL REQUIREMENTS _____

STAPLE HERE

PERMIT NO.
230
FIRST CLASS
PIQUA, OHIO

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY—

BRAMCO CONTROLS DIVISION
LEDEX INC.
P. O. BOX 207
PIQUA, OHIO 45356

SALES OFFICES

☐ LEDEX INC.

Home Office: 123 Webster Street, Dayton, Ohio 45402 • Phone 513-224-9891 • TWX 513-944-0286

☐ BRAMCO CONTROLS DIVISION

Home Office: College & South Streets, Piqua, Ohio 45356 • Phone 513-773-8271

Arizona

PHOENIX 85004
☐ Hyde Electronics Co., Inc. (L/B)
2727 N. Central Ave.
602-264-5609

California (South)

LOS ANGELES 90008
☐ Ledex Inc. (L)
4331¼ Leimert Blvd.
213-292-9183
TWX: (213) 296-0586

California (North)

PALO ALTO
☐ Testco (L)
941 Charleston Rd.
Suite #1
415-326-5320

REDWOOD CITY
☐ Logan Burres Industrial (B)
Sales Corporation
463 Brewster Avenue
415-369-6726

Colorado

DENVER 80223
☐ Hyde Electronics Co., Inc. (L/B)
888 South Lipan Street
303-936-3456
TWX: (303) 292-3595

Florida

CLEARWATER 33516
☐ W. Ben Wimberly Company (L/B)
532 South Ft. Harrison Avenue
813-446-7072
TWX: (813) 442-2378

ORLANDO 32801
☐ W. Ben Wimberly Company (L/B)
500 S. Osceola Street
305-425-3083
TWX: (305) 275-1358

Illinois

LA GRANGE 60525
☐ Ledex Inc. (L)
1415 West 47th Street
(Chicago) 312-242-1249
(La Grange) 312-354-3442
TWX: (312) 352-7765

LA GRANGE 60526
☐ Bierhaus Sales Company (B)
633 S. LaGrange Road
(Chicago) 312-242-3250
(La Grange) 312-354-3032

Kansas

WICHITA
☐ Thunderbird Engineering Sales (L)
and Services, Inc.
6405 East Kellogg
316-684-3941

LEAWOOD (Kansas City)
☐ Thunderbird Engineering Sales (L)
and Services, Inc.
3802-D West 95th Street
913-642-7220

Massachusetts

LEXINGTON 02173
☐ K. C. Stevens (L/B)
235 Bedford Street
617-862-1812

Michigan

BIRMINGHAM
☐ James P. Kosta, Jr. (L/B)
Box 292
313-646-9151

Minnesota

MINNEAPOLIS 55421
☐ E. A. Dickinson & (L/B)
Associates, Inc.
4916½ Tyler Street N.E.
612-336-7666

Missouri

ST. LOUIS 63134
☐ Thunderbird Engineering Sales (L)
and Services, Inc.
P. O. Box 6156
314-838-6688

New Jersey

RIDGEFIELD 07657
☐ Ledex Inc. (L)
753 Bergen Boulevard
201-945-1840
TWX: (201) 943-7928

New Mexico

ALBUQUERQUE 87110
☐ Hyde Electronics Co., Inc. (L/B)
5206 Constitution Ave., N.E.
505-265-8895

New York (N.Y.C., L.I.)

NEW YORK
☒ Ledex Inc. (L)
753 Bergen Boulevard
212-695-7078
TWX: (201) 943-7928

VALLEY STREAM
☐ D. R. Bittan Company, Inc. (B)
104 South Central Avenue
P. O. Box 385
516-561-2444
TWX: (516) 593-2156

New York (Upstate)

LIVERPOOL
☐ L. P. Garner (L)
P. O. Box 56
315-652-7911

ROCHESTER
☐ Harvey Dorren Engineering (B)
and Sales Company
248 Lycoming Road
716-334-3024

North Carolina

RALEIGH
☐ A. B. Andrews Company (B)
1208 Insurance Building
919-833-5567

Ohio

DAYTON 45459
☐ Thomas G. DeMuesy (L/B)
Box 7
513-885-2935

Pennsylvania

PHILADELPHIA 19118
☐ Victor S. Malta (L/B)
P. O. Box 4007
215-836-5122

PITTSBURGH 15235
☐ Russell F. Clark Company (L/B)
Laketon and Lindberg Roads
412-242-9500
TWX: (412) 642-3196

Texas

DALLAS 75206
☐ Koch Engineering & Sales Co. (L/B)
309 Meadows Building
214-361-1754
TWX: (214) 899-9042

HOUSTON
☐ Koch Engineering & Sales Co. (L/B)
1607 Jefferson
713-323-7051

Utah

SALT LAKE CITY 84111
☐ Hyde Electronics Co., Inc. (L/B)
85 E. 7th South
801-355-5361

Washington

SEATTLE 98108
☐ Testco (L/B)
Boeing Field — Room 114
206-733-9000
TWX: (206) 998-0747

Wisconsin

MILWAUKEE 53212
☐ E. A. Dickinson & (L/B)
Associates, Inc.
3612 North Green Bay Avenue
414-264-1080

Symbols denote representative offices as follows: L = Ledex Inc. B = Bramco Div. L/B = Ledex and Bramco